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**AUTHOR** Peters, Richard O.  
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**ABSTRACT**

Background information and a teaching strategy are provided to help students better understand the global energy crisis and learn to take action. An overview of the energy crisis includes a discussion of the unequal distribution of natural resources throughout the world, the finite nature of fossil fuels, and problems associated with the depletion of petroleum energy. Energy conservation, alternative resources, and renewable energy are emphasized as the best direction for present and future policies. In order to prepare students to become knowledgeable decision makers capable of dealing with the global energy issues, a proactive action model is proposed consisting of three parts: perception, thought pattern, and action. A sample unit on energy is included as an example of how the model may be used. (DC)

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**THE GLOBAL ENERGY CRISIS:  
Today and Tomorrow**

**Developing Proactive Action  
Student Awareness and  
Understanding About Finite  
Fuels and Alternative Energy  
Sources In A Global Age**

**Richard O. Peters, Ed.D.**

**GLOBAL HORIZONS**

**March 1982**

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### ABOUT THE AUTHOR

Richard O. Peters received his Bachelor of Science in Education and Master of Education degrees from The University of Maine (Orono); pursued doctoral studies at The Florida State University (Tallahassee); and was granted the Doctor of Education degree from The University of Rochester (NY).

Dr. Peters has been involved with the development of environmental education and global studies programs; Student Environmental Awareness (SEA), People In Their Environments (PIE), and Humans and Environment Learning Program (HELP).

In June 1982, Dr. Peters founded GLOBAL HORIZONS: The Center for Applied Ecosocial Studies for purposes of instructional program development (K-12), teacher inservice training, and to develop student awareness and understanding of the world and its people.

Dr. Peters has been published in several national periodicals including Environmental Education Report, Social Education, Journal of Geography, and The Social Studies Teacher as well as Resources In Education (ERIC) in the areas of environmental education and global studies.

Among Dr. Peters' workshop presentations are: The Interrelationships of the Social Studies and Environmental Education (K-12), Man In His World, SEA: A Community Based Strategy to Affect Student

Attitudes and Awareness of the Total Life Space Environment.

People In Their Environments. Need HELP? It's Here! as  
well as a guest panelist for "Technology Explosion" - Great  
Decisions '79 (WENH-TV).

## STATEMENT

Throughout the course of recorded history humans have become more and more dependent upon finite resources extracted from the earth for survival and well-being.

For millions of years nature processed, developed, and stored energy resources in the earth. With the beginning of the Industrial Revolution societies started drawing on the earth's energy assets. Since the end of World War II, the industrialized nations have been competing for nature's limited finite resources. As technology and industrial productivity have increased - the need for energy has also increased; multiplying at an unprecedented rate.

First coal, then oil and gas and nuclear power were used to produce steam and electricity for factories and homes. By the mid-20th Century, commerce, industry, and personal lifestyles were premised on a glut of cheap and abundant energy.

## THE CRISIS: HOW DID IT COME ABOUT?

Nature was not democratic in dispersing its wealth. Some nations were 'more-blessed' than others with an abundance of fossil fuels.

Over the past century, predominant dependence has shifted from renewable and natural energy sources (animals, wood, wind, and water) to primary reliance upon exhaustible fossil fuels; first coal, and then petroleum and natural gas. Petroleum started to become widely used in about 1920.

Since 1947 the United States has become a net importer of oil. Domestic oil production peaked in 1970. When domestic oil production became too expensive an undertaking, and when insufficient quantities were produced it was all too easy to supplement this amount with cheap foreign oil.

Then in 1973 the cheap oil phenomenon ended with the Arab oil embargo. Prices per barrel of crude jumped from \$3.00 to \$12.00, and in 1980 the base price per barrel of crude (from OPEC) was set at \$23.00; more than a seven hundred per cent (700%) increase in only seven years!

As societies became more technological in nature and substance there was an increased demand for more energy to fuel the process.

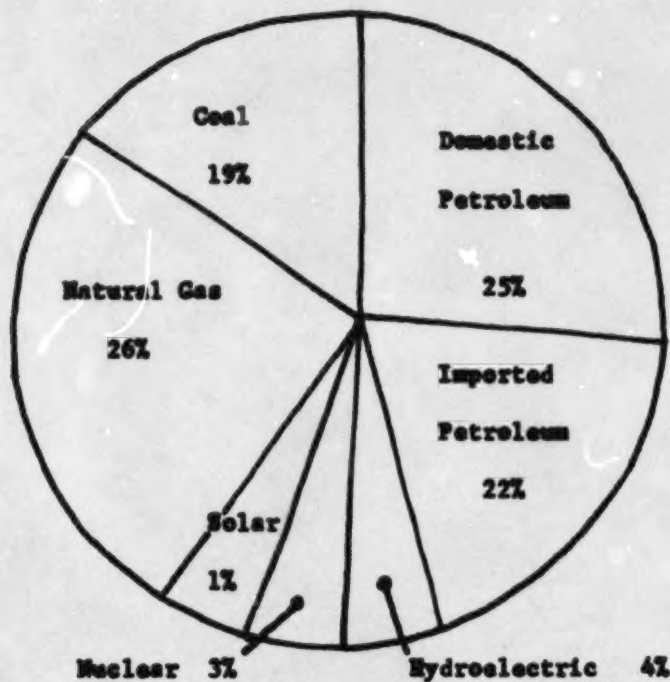
Today, all people (to varying degrees) depend upon these fossil fuel resources to maintain standards-of-living. Societies, as well as individuals, depend primarily upon fossil fuels to provide energy.

#### THE CRISIS: WHAT IS IT?

Once a finite source of energy is used up - for all practical purposes - it is gone forever because the rate of use is so much faster than the rate of resource formation. Energy deposits have

been formed by natural processes that have taken place over millions of years. The faster we use nonrenewable resources, the more rapidly the total supply diminishes. For example, most of the energy used throughout the world, today, still is drawn from the earth's capital assets. Each year the world consumes as much oil as it took nature two million years to create.

In 1978, nearly half of the United States' total energy needs were met by petroleum. In 1980, America's national consumption of oil equalled more than a fourth (25%) of the worldwide production of 60 million barrels a day.



All over the world people are burning large quantities of fossil fuels. Supplies of coal, oil and gas will soon be in short supply - in high demand. Some predict that supplies will soon be depleted! For example, Western Europe gets 55% of its energy from oil, and 75% of Japan's energy is derived from oil. In both cases, most of this oil is imported. The Soviet Union exports oil to both Eastern and Western Europe.

One of the most crucial debates of our time is centered on the question: what will the primary energy source be when the oil runs out early in the 21st Century?

#### PROBLEMS

1) According to the United States Department of Energy, energy trends indicate that world oil production will peak and start a long downward slide around the 1990s.

2) If fossil and nuclear fuel are to be used in the future, several serious environmental problems will arise. Land surfaces will be disturbed as 'overburden' is removed and fossil fuels are harvested. The use of coal and other fossil fuels will lead to increased pollution of the air, land, and water. The potential for nuclear disasters (such as Three Mile Island) will increase

on a global scale. France, Japan, and the Soviet Union, as well as the United States and other DC's, are placing an increased emphasis on nuclear energy production.

3) Milton Russell (1979) makes reference to two diametrically opposed world views which have influenced national/international energy policies.

a) Expansionist View: expanded production of goods/services and increased per capita consumption of energy are essential. The energy future lies with development of new sources which will replace depleting reserves at an appropriate time.

b) Limited View: changes in value systems and life styles are required, and the earth cannot sustain uncontrolled expansion of goods/services. Ever-growing energy use by an affluent minority represents an unfair diversion of world resources to a few, so that a limitation of energy demands is required in the interest of the broad global community.

4) Due to the increased global demand for energy, the search for fossil fuels has taken humans farther into the recesses of the earth - and on a more global scale. For example, offshore drilling, the Alaska and Soviet Arctic pipelines, polar regions, and the jungles of South America.

5) Energy resource considerations have resulted in new eco/political alliances and have, in some cases, upset the status quo.

a) The need for huge quantities of natural gas<sup>1</sup> in Western Europe, especially among NATO countries, has resulted in the construction of the West Siberian pipeline; 3400 miles from the Soviet Arctic to Western Europe. With increased dependence upon Soviet energy, Western Europe has a vested interest in improving relations with the USSR.

b) The People's Republic of China recently formed the China National Offshore Oil Corporation and has invited bidding by western oil companies for the right to develop offshore oil resources.

c) Beginning in 1980, the Export-Import Bank of Japan has loaned money to China for coal and oil development.

d) The proposed oil refinery for Eastport, Maine (Pittston Company, Greenwich, CT) has brought opposition from the Canadian government as well as various environmental groups

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Belgium, France, The Netherlands, Italy, and West Germany

in Canada and the United States. The Canadian government has imposed regulations on oil tanker traffic through the waters of Head Harbour Passage between New Brunswick and Maine (February 1982).

5) Mobil Corporation has made an agreement with New Zealand to build a plant to convert natural gas into high octane gasoline for domestic consumption.

6) Offshore drilling can cause oil spills; thus having negative effects upon coastal and underwater environments, and can result in disasters such as the sinking of the Ocean Ranger drilling rig off Newfoundland (February 1982). In recent years, massive oil spills have resulted from the loss of tanker ships such as the Torrey Canyon (1967), Argo Merchant (1976), and Amoco Cadiz (1978).

7) Joseph Harnett, President of Standard Oil Company (Ohio), blamed America's energy problems, in part, on three conflicting forces (1979).

a) Oil Industry: reduce dependency on foreign oil imports, support for the development of synthetic fuels, increase the availability of coal, and increase domestic crude oil production. The oil industry speaks in terms of economic realities, capital requirements, technology, material resources, and markets.

b) Social Advocates: crusades to protect the environment, to hamper exploration and the exploitation of available energy resources, and to promote the welfare of the 'common man' . "Backed by a formidable arsenal of governmental regulations the extremists of the environmental movement have severely crippled energy development in the United States." Social advocates speak in terms of minority rights, consumer safety and health, air-water-land pollution, conservation and wilderness preservation.

c) United States Government: the creation of regulatory agencies without any mechanism for reviewing the overall impact of millions of regulations, without plans for discovering duplicity or conflict, and without methods for assessing priorities. The government speaks in terms of legislation, regulation, nationalization, bills, vetoes, and judicial decisions - all in the name of the public's best interest.

America must achieve an equilibrium (cooperation) among the interests of the oil industry, social advocates, and the government.

8) The core of the energy problem, both United States and worldwide, is our excessive dependence on our two scarest energy resources - oil and natural gas.

### WHAT IS AHEAD?

With the continued depletion of the world's nonreplacable fuels, it is imperative that more attention be paid to energy conservation, the use of alternative resources, and renewable energy.

In 1979, Union Carbide conducted a national attitude survey among 1000 Americans. Results of that survey indicated that Americans supported a pluralistic approach to the nation's energy future - without undue reliance on any single energy option. Conservation was considered the fastest way to improve the nation's energy situation and was seen as one of the cheapest and most environmentally acceptable of the nation's energy options.

The United States and the world have a choice of alternative energy sources and techniques -- thanks, in part, to modern and efficient technology. Among the several alternatives are:

- . fossil fuels (coal, natural gas, oil)
- . nuclear power
- . synthetic fuels
- . geothermal power (heat from within the earth)
- . tidal power (the ebb and flow of the tides)
- . solar
- . wind (atmospheric movements)
- . hydroelectric energy (falling water)

- . photovoltaic cells
- . biomass (organic matter)
- . solar thermal energy conversion
- . ocean thermal energy conversion
- . satellite power systems (convert solar energy to microwave radiation)

According to The Global 2000 Report, while the world's finite fuel resources (coal, oil, natural gas, oil shale, tar sands, and uranium) are theoretically sufficient for centuries, they are not evenly distributed; they pose difficult economic and environmental problems - and they vary greatly in their amenability to exploitation and use.

During the 1990s world oil production will approach geological estimates of maximum production capacity. With expected price increases, many less-developed countries will have increasing difficulties meeting energy needs. Petroleum production capacity is not increasing as rapidly as demanded.

Oil is projected to remain the world's leading energy source through 1990. Per capita energy consumption is projected to increase everywhere.

The United States is the world's third largest producer of petroleum - behind the Soviet Union and Saudi Arabia. Coal

resources far exceed supplies of oil and gas in this nation. Coal is the only fossil fuel in which America is totally self-sufficient.

It is important that the United States cooperate generously and justly with other nations in seeking solutions to the many problems that extend beyond our national boundaries. On February 24, 1982 President Ronald Reagan appeared before the Organization of American States (OAS) and proposed a cooperative program of industrial/economic betterment for the island nations in the Caribbean Basin as well as other parts of Central and South America. Energy considerations would be an important aspect of this cooperative program of self-help.

In 1978, Dr. Albert A. Bartlett, Department of Physics and Astrophysics, The University of Colorado, explained the energy crisis in terms of exponential growth. This growth occurs when the rate of consumption of a resource (measured in terms of yearly tonnage or in barrels per year) is growing a fixed percent per year. The important property of the growth is that the time required for the growing quantity to increase its size by a fixed fraction is constant. A constant time is required for the growing quantity to double its size. Exponential growth is characterized by doubling, and a few doublings can lead quickly to enormous numbers. The increase

in any doubling is approximately equal to the sum of all the preceeding growth!

Growth of the world's human population and the growth of per capita consumption of resources lie at the heart of our energy problem. When consumption is rising exponentially, a doubling results (within the remaining resource) in only a small increase in the life expectancy of the resource.

C.C. Gavin, Chairman of the Exxon Corporation (1976) has stated that getting on top of the (global) energy problem won't be easy. It will be an expensive and time-consuming task. It will require courage, creativeness, and discipline.

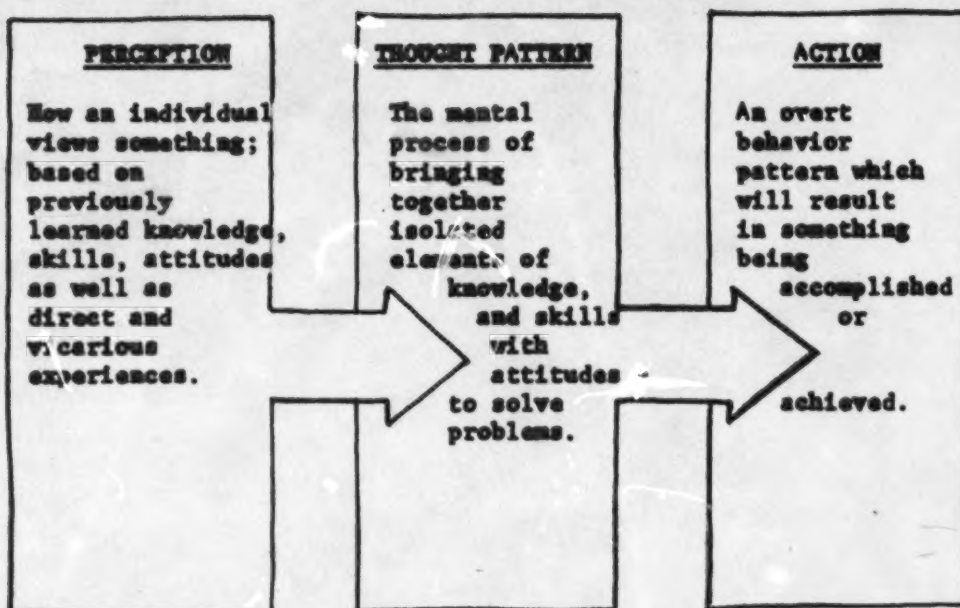
#### PREPARING INDIVIDUALS FOR THE GLOBAL AGE

In order for any individual to successfully function in a global environment, he/she must, first of all, possess the knowledge, skills, and attitude necessary for relating to other cultures and people -- especially to those cultures and people which are quite different in customs and practices. Second, this individual must have a strong, intrinsic urge to help - both himself/herself as well as others. Third, the individual must assume partial responsibility for the plight of the world and must feel an obligation to help right the global wrongs. Fourth, the individual must be skilled in information analysis and critical decision making. Fifth, the individual must possess

the courage to act upon his/her convictions of what is correct and proper, and of what needs to be done at a given moment in time.

In order to create such individuals the process of formal education in the United States as well as in other DC's and LDC's must not only inform students but must also give them opportunities to function as decision makers in both real and contrived situations. The Preactive Action Model can be used as a foundation for instructional program development and student learning experiences. Put simply, the Preactive Action Model combines elements of Bloom and Krathwald's affective, cognitive, and motor skills domains of the educational taxonomy into a process of awareness (perception), inquiry/discovery (thought pattern), and performance (action) -- which results in individuals who sense their roles as global citizens and who know how to conduct themselves from given situation to given situation.

Proactive Action Model



Sample Unit

Area of Study: Energy

Concept: Finite and renewable fuels

Purpose: To acquaint students with contemporary energy types, with energy needs/uses, and with diverse energy sources - worldwide.

Grade Range: 7 - 12

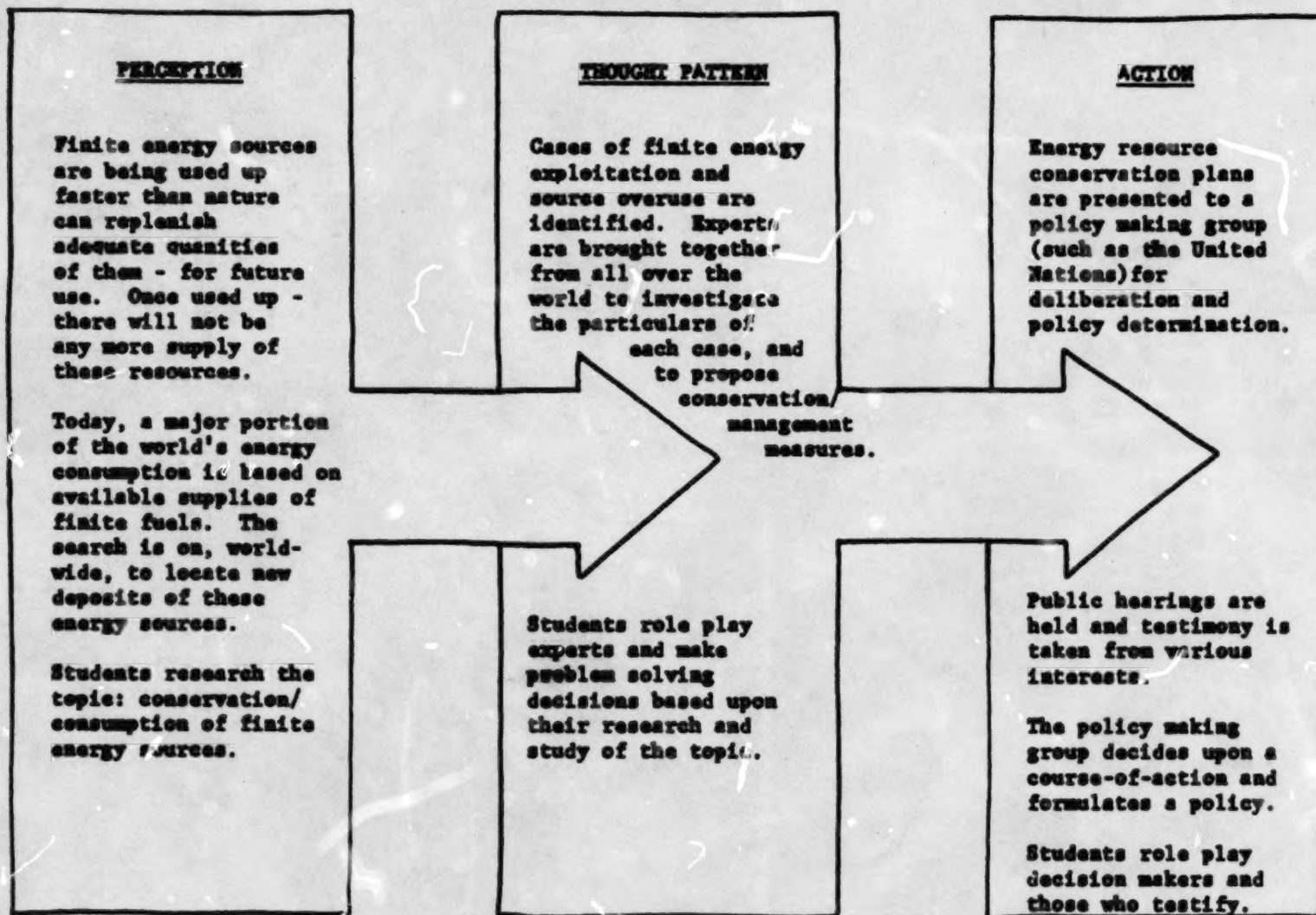
Activities:

- 1) Audiovisual software (e.g., films, filmstrips, slides, video tapes) are used to expose students to alternative energy sources and their use - worldwide.
- 2) Audiovisual software is used to introduce students to the energy crisis - both within the United States and worldwide.
- 3) Students select types of energy and research them. Reports are developed.

- 4) Students take field trips into the community to observe uses of finite and renewable energy. Conservation plans are developed. Reports can be developed. Films and video tapes can be made.
- 5) Students take field trips into the community to observe the varied effects of finite and renewable energy on both environments and people. Reports can be developed. Films and video tapes can be made.
- 6) Guest speakers visit classrooms to discuss their experiences with the field of energy and their related training. These visits can be filmed or video taped and filed for future use - with other classes.
- 7) Students are involved in a decision making simulation. This activity can be filmed or video taped. (See PROACTIVE ACTION MODEL example)
- 8) Students collect pictures and draw pictures depicting the world of energy and its uses, and compile them into a bulletin board display.
- 9) Students make table top models of hydro-electric plants, solar panel and cell collectors, etc.
- 10) Within the community/area students identify one energy source and research its use and effects upon the environment/people as well as cost, facilities, and supplies. Reports can be developed.
- 11) Students identify area energy problems, research problems/possible solutions, and propose action plans. These plans can be presented to government/industry officials as well as to citizen/special interest groups.

- 12) Students organize an energy fair. Representatives of energy suppliers, from business/industry, energy consumer groups, government representatives, alternative energy experts, solar building designers, etc set up displays, make presentations, and answer topic related questions. Career opportunities in the energy field are also discussed.  
This fair is open to the general public as well as being targeted to the student population.
- 13) Students develop reports which trace the history of energy use in the United States and on a global scale.
- 14) Students create a hypothetical community (complete with available energy resources) and determine how available energy will be used/conserved.
- 15) Students investigate the topic: energy conservation, and develop a media report. This report can be shown to the general public as well as to special groups within the community.

**NOTE:** The activities listed herein are only suggestions which can be modified/used by classroom teachers in any sequence so desired. Other activities can be added to the list or used in place of listed activities - at the discretion of the individual teacher.



**PROACTIVE ACTION MODEL, Example**

REMARKS

The United States is not alone in its confrontation with the energy crisis; it is global in nature and scope. The effects of this crisis are felt around the globe; in the developed countries and well as in the less-developed countries. Solutions to this 'problem' must be found on a global plane.

According to Joseph Harnett (1979) whether or not we can achieve a sense of cooperation (regarding energy conservation and alternative energy development), on a global scale, will depend on whether or not people choose to become more than mere spectators in the drama of their own lives. In other words, people can no longer afford to be passive citizens of the world -- instead, they must actively participate in the decision making process regarding their survival on earth! Harnett is calling for those qualities of action and involvement within individuals which are typical characteristics of proactive action individuals.

More and more people, worldwide, must become better informed about economic and political issues which effect their daily lives; including the distribution and use of finite and renewable energy sources. In order to become better informed and more-knowledgeable about international agreements/policies regarding energy consumption and conservation, the individual must take a more active, voluntary role in the decision making process; either directly or through appointed/elected representatives. The decade of the 1980s is a time when everyone should be taking part in global problem solving rather than turning their backs on these crucial issues.

SELECTED ORGANIZATIONS

American Petroleum Institute  
2101 L Street, NW  
Washington, DC 20037

Center for Renewable Resources  
1001 Connecticut Avenue, NW  
Washington, DC 20036

Environmental Defense Fund  
2606 Dwight Way  
Berkeley, CA 94704

Institute of Gas Technology  
3424 South State Street  
Chicago, IL 60616

Resources for the Future  
1755 Massachusetts Avenue, NW  
Washington, DC 20036

Solar Energy Research Institute  
1617 Cole Boulevard  
Golden, CO 80401

U.S. Department of Energy  
1000 Independence Avenue, SW  
Washington, DC 20585

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